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(54) METHOD OF MAKING NON-BUTTERFAT FOOD PRODUCTS

(71) We, STAUFFER CHEMICAL COMPANY, a corporation organised under the laws of the State of Delaware, U.S.A., of 299, Park Avenue, New York, N.Y. 10017, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This application relates to an improved process for the manufacture of non-butterfat food products and more particularly to a process for manufacturing non-butterfat food products in which whey is employed as a component of the composition.

Non-butterfat food products are synthetic or prepared food products, generally dairy type products, which contain no butterfat, but instead contain vegetable oils or other fats. They can be prepared as dry powders, as liquids or as a product intermediate a solid and a liquid. Included within the category of non-butterfat food products are coffee whiteners, which are used conventionally as a replacement for cream or milk in coffee; whipped topping bases, which are used as a replacement for whipped cream in various desserts; frozen desserts such as mellorines and ice milks; imitation sour creams; imitation cream cheeses; cream pie bases; cocoa drinks; instant breakfasts; process cheese; soups; baby foods; filled milk, and imitation milk. In the past, such preparations have conventionally contained such ingredients as corn syrup solids or sugars, salts, stabilizers, emulsifiers, oils, fats or vegetable shortenings, water and sodium caseinate.

While sodium caseinate has served effectively as an ingredients in such preparations, shortages in milk from which sodium caseinate is prepared have led to the proposal to use whey solids as a replacement for sodium caseinate.

As a by-product of cheese production, whey has long been discarded as waste. In recent times, world-wide shortages of protein have directed a considerable effort to the recovery of whey protein as a food source. While a relatively small proportion of whey is utilized in animal feed, and a proportion is dried and utilized for human consumption, a large proportion of whey is still discarded as waste. This has resulted not only in a loss of recoverable protein as a food source, but has also contributed to the pollution of many streams, lakes and rivers.

The very composition of whey has historically mitigated against its use as a food source. Whey contains only from about 5 to about 10% solids, the remainder being water. Thus, to even produce dry whey solids, a disproportionately large amount of water must be removed. Large-scale drying techniques have in recent years been developed, however, which make the production of dry whey solids both technically possible and economically feasible. A very large proportion of the dried whey produced, however, still is utilized as animal feed. Utilization of whey solids in food compositions for human consumption has not proved feasible because of the functional deficiencies inherent in the dry whey solids themselves.

The use of whey has proven functionally deficient in non-butterfat containing food product compositions, although such products could theoretically utilize whey solids. Dry whey used in non-butterfat coffee whitener compositions, for example, results in products which exhibit oil separation and feathering in hot coffee. While this is nutritionally unimportant, it is aesthetically unacceptable. Coffee whiteners utilizing dried whey exhibit not only the foregoing deficiencies but additionally are subject to phase separation, which again is unacceptable from a market stand point.

In our copending application No. 33059/69 (Serial No. 1,282,501) we have disclosed and

formulation has been decided upon. Minor adjustments in the amount of water can, of course, also be made to suit a given recipe or change.

The amount of alkali metal polyphosphate utilized in the process of this invention will vary slightly depending upon the particular liquid whey employed, the pre-treatment, if any, and the particular formulation or recipe in which they are to be used. However, amounts of at least 0.1% by weight based on the total composition of the polyphosphate must be present although generally amounts of at least 1.0% by weight based on the percent whey protein are satisfactory. It is preferred that amounts from 10 to 40% be used, and most preferred that amounts from 25.0 to 35% be used, the amounts being by weight and being based on the percent whey protein. Again, slight adjustment well within the skill of the art may be desirable to achieve optimum performance in any given formulation. Weight ratios of 5:1 protein to phosphate to 3:1 are preferred based on economic considerations and optimum performance, although higher and lower ratios can be employed, if desired.

The term "oil" as used herein is intended to include both the vegetable oils and shortenings as well as such animal fats and oils which are similarly employed. It is, of course, understood that such animal oils exclude butterfat. Illustrative of such oils are the various seed oils such as soybean oil, corn oil, coconut oil, peanut oil and safflower seed oil. Also included within this term are mixtures of such oils as well as the hydrogenated oils which are conventionally marketed as vegetable shortenings.

Other ingredients which are conventionally used in the non-butterfat food product compositions and which can be employed effectively in the present invention are set forth below. It is, of course, understood that these ingredients are exemplary, and effective conventional substitutes therefore can be used, if deisred.

Emulsifying agents conventionally used in these formulations are the mono- and diglycerides of the fatty acids, usually in admixture. Other food-grade emulsifiers can also be used within the scope of this inventiton.

Various gums are conventionally employed as stabilizers such as carrageenin, gum tragacanth, guar gum, and carboxymethyl cellulose. Corn syrup solids are conventionally employed in these mixtures, although any other dextrose material which provides results equivalent to corn syrup solids can, of course, be used herein. Sugars, as well as the various natural and artificial sweeteners such as honey and the cyclamates can be used also. Various flavourings are also conventionally employed to impart a particular flavour to the final product.

A buffer is also conventionally employed such as dipotassium phosphate. Other equivalent food-grade buffer materials can be and are used in these formulations, such as sodium phosphate.

Since the amounts of these additional ingredients vary from composition to composition, it is difficult to provide general amounts employed in respect to them. However, under the discussion of the individual representative non-butterfat food products which follows, general amounts employed for each of these ingredients are specified. In any event, these formulations, ingredients and their amounts are well known in the art as they are conventionally employed.

The various ingredients used in any given formulation in this process can be initially mixed and charged to a conventional food-grade homogenizer. While it is desirable to use a conventional two-stage homogenizer, any equivalent type homogenizing apparatus can be employed.

Homogenization breaks up the fat globules and stabilizes the fat emulsion against gravity separation. The product to be homogenized may be pumped under pressure of several thousand pounds through a constricted orifice, in which process the fat globules are disintegrated in smaller globules.

The homogenization step is conventionally conducted under superatmospheric pressure. These pressures are desirably from 3000 to 500 psig. This homogenization step is also carried out under an elevated temperature of from 150° F. to 180° F.

After the mixture has been homogenized, it is then conducted to the next step of the operation. If, of course, the formulation being prepared is a liquid, after homogenization the product is removed and packaged. If, on the other hand, the product being prepared is a dry formulation, then the homogenized liquid is removed and dried by such conventional equipment as spray drying or tray drying, and is thereafter packaged. As an optional step, the dried products can be post-treated to agglomerate particles and size them to enhance the dissolving properties of the product and reduce dustiness.

Whey should preferably be employed in such amounts to provide the non-butterfat dairy product with a protein content of at least 0.3% when demineralized whey is employed and at least 0.8% when undemineralized whey is employed.

As indicated above, the compositions of this invention are directed primarily to utilization in non-butterfat food products. Certain of these non-butterfat food products are described in detail hereinafter. For convenience, sodium caseinate has been used as an illustrative component. It is understood, however, that the condensed whey-phosphate ingredients employed in the process of this invention serve

Coffee Whiteners, Dry

Ingredients	% (Range)
Sodium caseinate	5.0 — 10.0
and	
Water	As needed to bring formulation to 100%
OR	
Condensed whey containing from 3% to 6% water	22.0 — 44.0
and	
Sodium or potassium polyphosphate having a P_2O_5 content of at least 66%	0.1
Vegetable shortening	35.0 — 50.0
Corn syrup solids	35.0 — 50.0
(Adjusted for phosphate-whey mixture)	12.0 — 17.0
Emulsifiers and stabilizers	0 — 5.0
Dipotassium phosphate	0.45 — 3.0
Flavouring	As needed

In the foregoing formulations, condensed whey and polyphosphate can be used to replace the sodium caseinate in whole or in part.

In preparing the liquid coffee whitener, the sodium caseinate and whatever water is needed to bring the total formulation to 100%, or the liquid condensed whey and the polyphosphate are admixed with the dipotassium phosphate. This mixture is agitated until the materials are dissolved. To this mixture are added the corn syrup solids and the vegetable shortening. This mixture is heated to a temperature of approximately 160°F. and the food stabilizer-emulsifier combination is added thereto. The mixture is heated further with agitation for approximately five minutes. Any additional ingredients such as the flavouring, colour, and the like can be added at this point. The hot solution is then homogenized in a two stage homogenizer, preferably using 2500/500 psig. pressure. The homogenized mixture is then cooled to a temperature of about 35°—40°F. and packaged. This procedure will produce a liquid coffee whitener. If, on the other hand, it is desired to prepare a dry coffee whitener, the dry coffee whitener formulation is utilized in the procedure given for preparing a liiquid coffee whitener and the homogenized liquid is removed and dried by conventional drying equipment such as spray drying or tray drying.

Two typical type formulations for coffee whiteners utilizing condensed whey and polyphosphate are set forth below:

In the examples which follow and throughout this specification all parts and percentages given are by weight unless otherwise specified. Additionally, the following terms have the following meaning throughout:

Corn syrup solids—24 DE—Powdered maltodextrin produced by spray drying low concentration corn syrup. The numeral letter designation refers to a 24 Dextrose equivalent.

Carrageenin is a gum extracted from red seaweed (Irish Moss).

Emulsifier—In each instance the emulsifier used was a mixture of mono- and diglycerides of the fatty acids containing approximately 40% monoglyceride.

Vegetable shortening—Hydrogenated vegetable oil.

It will be noted that in the various non-butterfat food products set forth herein when the whey-polyphosphate mixture of this invention is used, the sugar or corn syrup solids should be adjusted. This adjustment is by reduction in amount necessary and provides a savings.

The following description sets forth in complete detail several other non-butterfat food products:

Whipped Topping Bases

Whipped toppings for desserts have been utilized in commercial bakeries for some time; it was not, however, until the advent of the commercial aerosol can that these toppings attained widespread home use. Sodium caseinate is conventionally utilized in the preparation of the whipped topping bases utilized in both the commercial toppings, liquid and dry, as well as the aerosol can type. These toppings are another example of non-butterfat dairy products made without sacrifice of flaxour or aesthetic appearance. Within the provisions of this invention it has been found that the sodium caseinate can be replaced totally or partially on a protein basis in whipped topping bases to provide equal or superior results. Sodium caseinate is utilized to fulfill the same function here as in coffee whiteners, i.e., to bind water and encapsulate the soil or fat droplets thereby stabilizing the emulsion and stabilizing the foam eventually produced. Sodium caseinate is normally used in these composition in an amount of from 0.5% to 10% by weight.

Representative formulations of both liquid and dry whipped topping bases are set forth below showing relative ranges of ingredients.

Whipped Toppings, Liquid

Ingredients	% (Range)
Sodium caseinate	0.5 — 5.0
and	
Water	As needed to bring formulation to 100%
OR	
Condensed whey containing from about 60% to 90% water	60.0 — 70.0
and	
Sodium or potassium polyphosphate having a P_2O_5 content of at least 66%	0.10
Sugar	0 — 15.0
Corn syrup solids	0 — 15.0
(Adjusted for phosphate-whey mixture)	0 — 5.0
Vegetable shortening	20.0 — 40.0
Stabilizers and emulsifiers	0.2 — 5.0
Flavour and colour	As needed

Frozen Desserts e.g. Mellorines, Ice Milks

Ingredients	% (Range)
Sodium caseinate	0.5 — 5.0
and	
Water	As needed to bring formulation to 100%
OR	
Condensed whey containing from 60% to 90% water	70.0 — 60.0
and	
Sodium or potassium polyphosphate having a P_2O_5 content of at least 66%	0.1
Sugar	0 — 25.0
(Adjusted for phosphate-whey mixture)	0 — 15.0
Corn syrup solids	0 — 25.0
(Adjusted for phosphate-whey mixture)	0 — 8.0
Vegetable shortening	5.0 — 15.0
Stabilizers and emulsifiers	0.1 — 3.0
Flavouring, colour, salt	As needed

The sodium caseinate or condensed whey and polyphosphate is blended with the sugar and stabilizer, in a steam jacketed kettle with stirring. While stirring, the corn syrup solids are added and stirred, followed by the addition of the shortening, emulsifiers and salt. The mixture is heated in the kettle to a temperature of 160° F. The hot solution is homogenized in a two-stage homogenizer at 2500/500 psig. The homogenized liquid is cooled to a temperature of 35° to 40° F. and was aged overnight at this temperature. The aged solution is frozen in a conventional commercial ice cream freezer at 20°—25° F. and then permitted to harden at a temperature of about −10°F. for a period of about 12 hours.

Imitation Sour Cream

A general formulation for imitation sour cream is as follows:

Imitation Cream Cheese

Ingredients	% (Range)
Sodium caseinate	0.5 — 5.0
and	
Water	As needed to bring formulation to 100%
OR	
Condensed whey containing from 60% to 90% water	60.0 — 70.0
and	
Sodium or potassium polyphosphate having a P_2O_5 content of at least 66%	0.1 — 4.5
Sugar or corn syrup solids (Adjusted for phosphate-whey mixture)	2.3 — 23.0 5.0 — 15.0
Vegetable shortening	15.0 — 40.0
Stabilizer and emulsifiers	0.1 — 5.0
Flavourings, colour	As needed

Imitation Cream Cheese

Ingredients	Percent
Sodium caseinate	2.5
and	
Water	As needed to bring formulation to 100%
OR	
Condensed whey containing 85.7% water	63.85
and	
Sodium or potassium polyphosphate having a P_2O_5 content of at least 66%	3.80
Corn syrup solids (Adjusted for phosphate-whey mixture)	2.3 — 23.0 3.80
Salt	0.15
Stabilizer and emulsifier	2.55
Vegetable shortening	25.00
Flavoured acid	0.85

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